Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 14, 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Schilling et al. (US 3,952,939).

Regarding claim 1, Schilling et al. discloses a method for wafer bonding, the method comprising steps of:

providing wafers to be bonded (Schilling, Abstract);

cleaning the wafers to remove particle and chemical contaminants from bonding surfaces of the wafers (Schilling, Col. 2 lines 60-61);

bringing the bonding surfaces of the wafers together to weakly bond the wafers to each other (Schilling, Abstract);

placing the wafers in a pressurization chamber (Schilling, Abstract);

solely through isostatic pressure, applying bonding pressure to the wafers (Schilling, Abstract);

heating the wafers during said step of applying bonding pressure (Schilling, Abstract); and

controlling and maintaining said steps of heating and applying bonding pressure for a period of time to substantially strengthen bonding between the wafers (Schilling, Abstract).

Regarding claim 2, Schilling et al. discloses the method of claim 1, further comprising steps of: cooling the wafers; and removing the wafers from the pressurization chamber (Schilling, Abstract);

Regarding claim 3, Schilling et al. discloses the method of claim 2, wherein said step of cooling is conducted while said step of controlling and maintaining continues said step of applying bonding pressure, followed by a step of depressurization (Schilling, Fig. 3).

Regarding claim 4, Schilling et al. discloses the method of claim 1, wherein said step of controlling and maintaining comprises: creating a temperature ramp and a pressure ramp to substantially strengthen bonding between the wafers (Schilling, Entire document—the process disclosed by Schilling is "to improve bonding" which implicitly mean to strengthen bonding);

Regarding claim 5, Schilling et al. discloses the method of claim 4, wherein said step of controlling and maintaining creates the temperature ramp as a function that is independent from the pressure ramp (Schilling, Fig. 3).

Regarding claim 6, Schilling et al. discloses the method of claim 1, wherein said step of heating commences prior to said step of applying pressure (Schilling, Fig. 3).

Regarding claim 14, Schilling et al. discloses the method of claim 1, further comprising, immediately prior to said step of applying and said step of heating, purging the pressurization chamber (Schilling, Abstract and Fig. 3).

Regarding claim 16, Schilling et al. discloses the method according to claim 15, wherein the pressurization chamber comprises a hot isostatic press (Schilling, Abstract and Fig. 3).

Regarding claim 17, Schilling et al. discloses the method of claim 1, wherein said step of heating commences with or after said step of applying pressure (Schilling, Fig. 3).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhat et al. (US 5,207,864) in view of Benavides et al. (US 6,443,179 B1) and/or Curbishley et al. (US 4,587,700), in further view of Applicant's Admitted Prior Art (AAPA – PGPUB paragraphs [0001-8]).

Regarding claim 1, 11, 12, 14-16, 19, Bhat et al. discloses a method for wafer bonding, the method comprising steps of:

providing wafers to be bonded (Bhat, Abstract);

cleaning the wafers to remove particle and chemical contaminants from bonding surfaces of the wafers (Bhat, Abstract);

bringing the bonding surfaces of the wafers together to weakly bond the wafers to each other (Bhat, Abstract);

placing the wafers in a pressurization chamber (Bhat, Abstract);

applying bonding pressure to the wafers (Bhat, Abstract);

heating the wafers during said step of applying bonding pressure (Bhat, Abstract); and

controlling and maintaining said steps of heating and applying bonding pressure for a period of time to substantially strengthen bonding between the wafers (Bhat, Abstract);

Bhat et al. does not specify that the pressure is applied solely through isostatic pressure. It was however known to those of ordinary skill in the art to solely apply an isostatic type of pressure when bonding wafers. At the time of the invention it was conventional use hot press bonding as well as Hot Isostatic Press or Hot Isostatic Processing (HIP) diffusion bonding. HIP is known conventional means of applying evenly controlled pressure. It would be obvious to one of ordinary skill in the art to select isostatic means for applying pressure when bonding wafers. For an examples of one of ordinary skill in the art applying isostatic pressure when performing a diffusion bonding process see Benavides et al. Col. 9 lines 1-6 and/or Curbishley Col. 1 lines 49-68.

Benavides et al. Col. 9 lines 1-6 - *Fabrication of ceramic parts can be performed by processes well-known to the art (e.g. slip casting, machining in the green state, cold - isostatic pressing (CIP) followed by hot -isostatic pressing (HIP) or sintering, and uniaxially hot/cold pressing, or rapid forging).*

Curbishley Col. 1 lines 49-68 - *The bonding of dissimilar metals by hot isostatic pressing (HIP) has been suggested for manufacture of dual alloy turbine wheels, since this process does not have the inherent joint size limitations of the inertia-welding process. Hot isostatic pressing is a process in which the pressure is applied equally in all directions through an inert argon gas in a high temperature pressure vessel or autoclave. Cross Pat. No. 4,096,615, Ewing et al., Pat. No. 4,152,816, and Catlin Pat. No. 3,940,268 are generally indicative of the state of the art for hot isostatic pressing as applied to manufacture of dual alloy turbine wheels. Kirby Pat. No. 3,927,952, assigned to the present assignee, is indicative of the state of the art in manufacture of cooled turbine disks and discloses photochemically etching recesses in thin single alloy disks to produce corresponding holes which are aligned when the disks are subsequently vacuum diffusion bonded together to create a laminated structure in which fluid cooling passages extend from a central bore of the hub to and through the turbine blades. Cooled turbine discs are necessary in small, high-temperature gas turbine components that are subjected to exceedingly high external gas temperatures, wherein the blade metal temperatures may reach the range of 1700 to 1800 degrees Fahrenheit. The cooling passages are necessary to prevent the blades from exceeding this temperature range in order to prevent excessive creep of the blade material.*

It would have been obvious to one having ordinary skill in the art at the time the invention was made to select isostatic means of applying pressure since it has been held to be within the general skill of a worker in the art to select a known process on the base of its suitability, for its intended use involves only ordinary skill in the art.

When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. KSR Int'l Co v. Teleflex Inc.

Regarding claim 2, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, further comprising steps of: cooling the wafers; and removing the wafers from the pressurization chamber (Bhat, Col. 6 line 10).

Regarding claim 3, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 2, wherein said step of cooling is conducted while said step of controlling and maintaining continues said step of applying bonding pressure, followed by a step of depressurization (Bhat, Abstract).

Regarding claim 4, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, wherein said step of controlling and maintaining comprises: creating a temperature ramp and a pressure ramp to

substantially strengthen bonding between the wafers (Bhat, Entire document—the process disclosed by Bhat is to improve bonding which implicitly mean to strengthen bonding);

Regarding claim 5, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 4, wherein said step of controlling and maintaining creates the temperature ramp as a function that is independent from the pressure ramp (Bhat, Abstract).

Regarding claim 6, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, wherein said step of heating commences prior to said step of applying pressure (Bhat, Abstract).

Regarding claim 7, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, wherein said step of heating commences with or after said step of applying pressure (Bhat, Abstract).

Regarding claim 8, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, wherein said step of cleaning creates hydrogen terminated surfaces at the bonding surfaces (Inherent result of HF dip).

Regarding claim 9, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, wherein said step of bringing creates one of a Van der Waals and Hydrogen bond (Bhat, Abstract).

Regarding claims 10 and 13, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 9, wherein said step of bringing brings the bonding surfaces into direct contact with each other with or without an intervening layer (direct and indirect bonding are known in that art. The selection of the two types of bonding, indirect or direct bonding, is a matter of design choice which is dependent upon the materials which are being bonded. One of ordinary skill in the art would be able to select one of the two known process on the base of its suitability (For support see AAPA PGPUB paragraph [0004]).

Regarding claim 17, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, wherein said steps of providing, cleaning and bringing are repeated to form a plurality of weakly bonded pairs of wafers and said steps of applying, heating, and controlling and maintaining are carried out with the plurality of weakly bonded pairs of wafers simultaneously in the pressurization chamber (Bhat, Abstract).

Regarding claim 18, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 1, further comprising, prior to said step of placing,

loading said wafers in an unsealed container, and wherein said step of placing is carried out by placing said unsealed container in said pressurization chamber (Bhat, Abstract).

Regarding claim 20, Bhat in view of Benavides and/or Curbishley in further view of AAPA disclose the method of claim 19, further comprising a step of controlling said heating and pressing to induce strain in at least one of said wafers (inherent result of heat/pressure bonding process).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jarrett J. Stark whose telephone number is (571) 272-6005. The examiner can normally be reached on Monday - Thursday 7:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jarrett J Stark
Examiner
Art Unit 2823

JJS
June 4, 2008

/Michelle Estrada/
Primary Examiner, Art Unit 2823